

Final Simulations to Test AC Settling

TIPL 4405

TI Precision Labs – ADCs

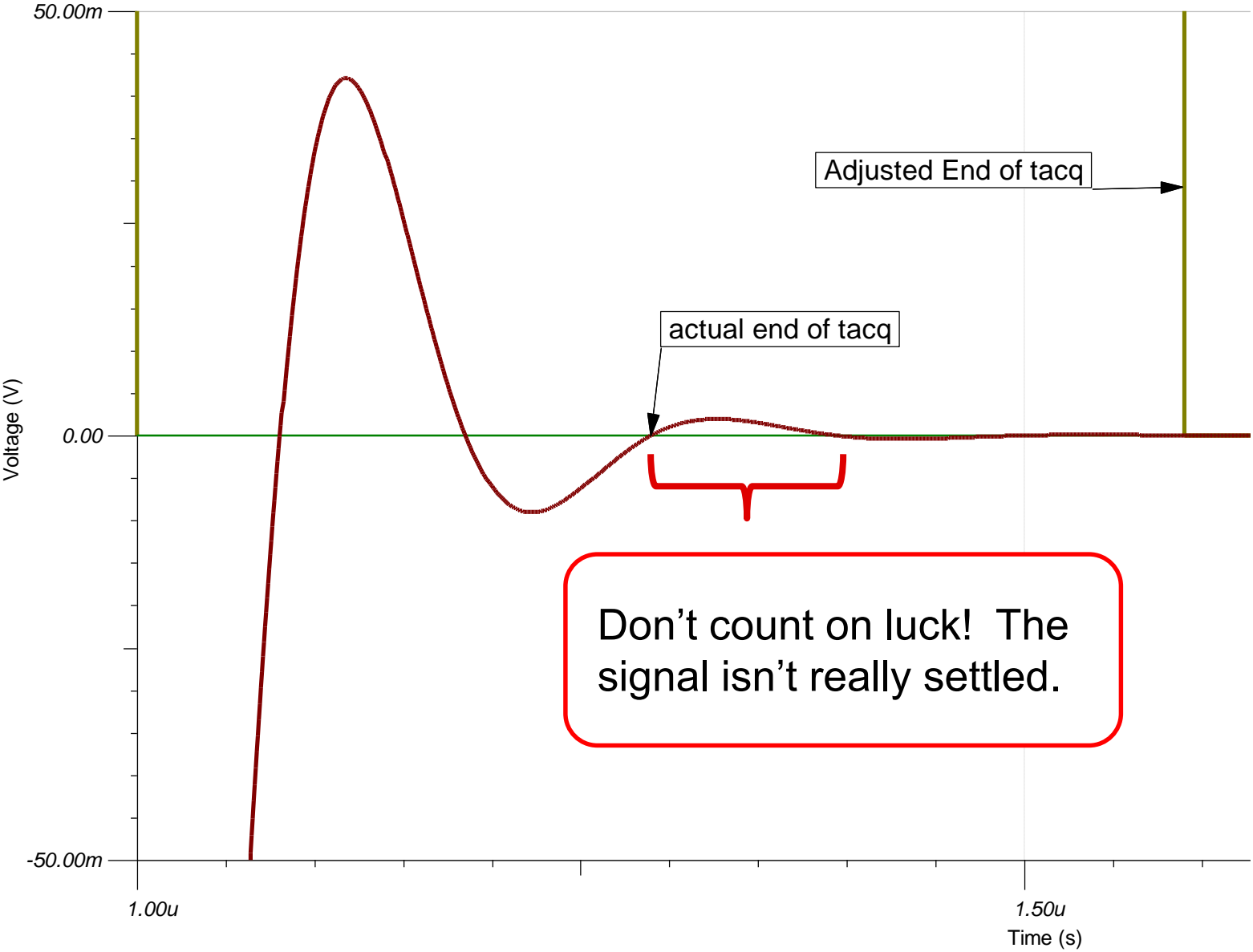
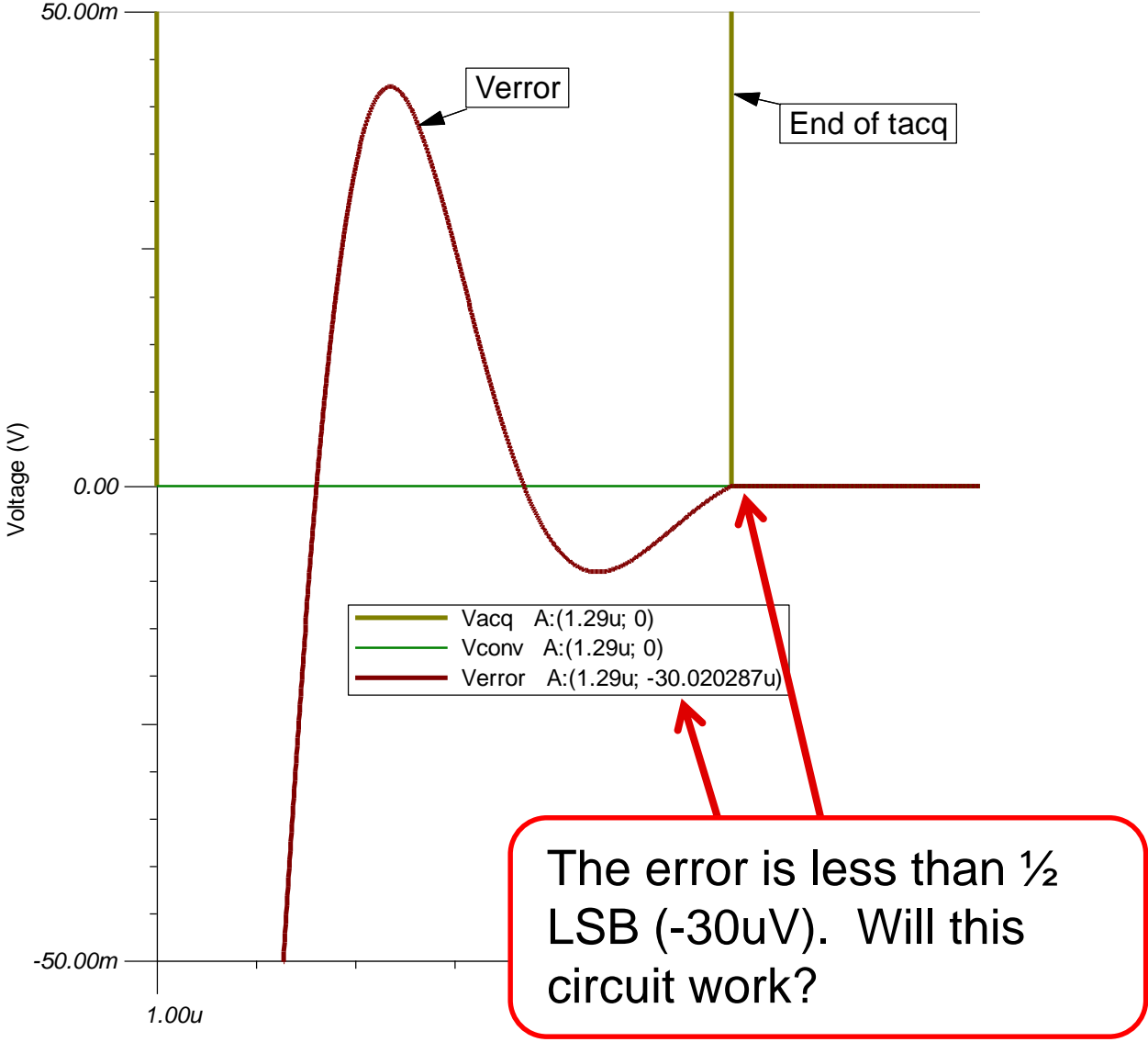
Created by Luis Chioye, Art Kay

Presented by Peggy Liska

Agenda

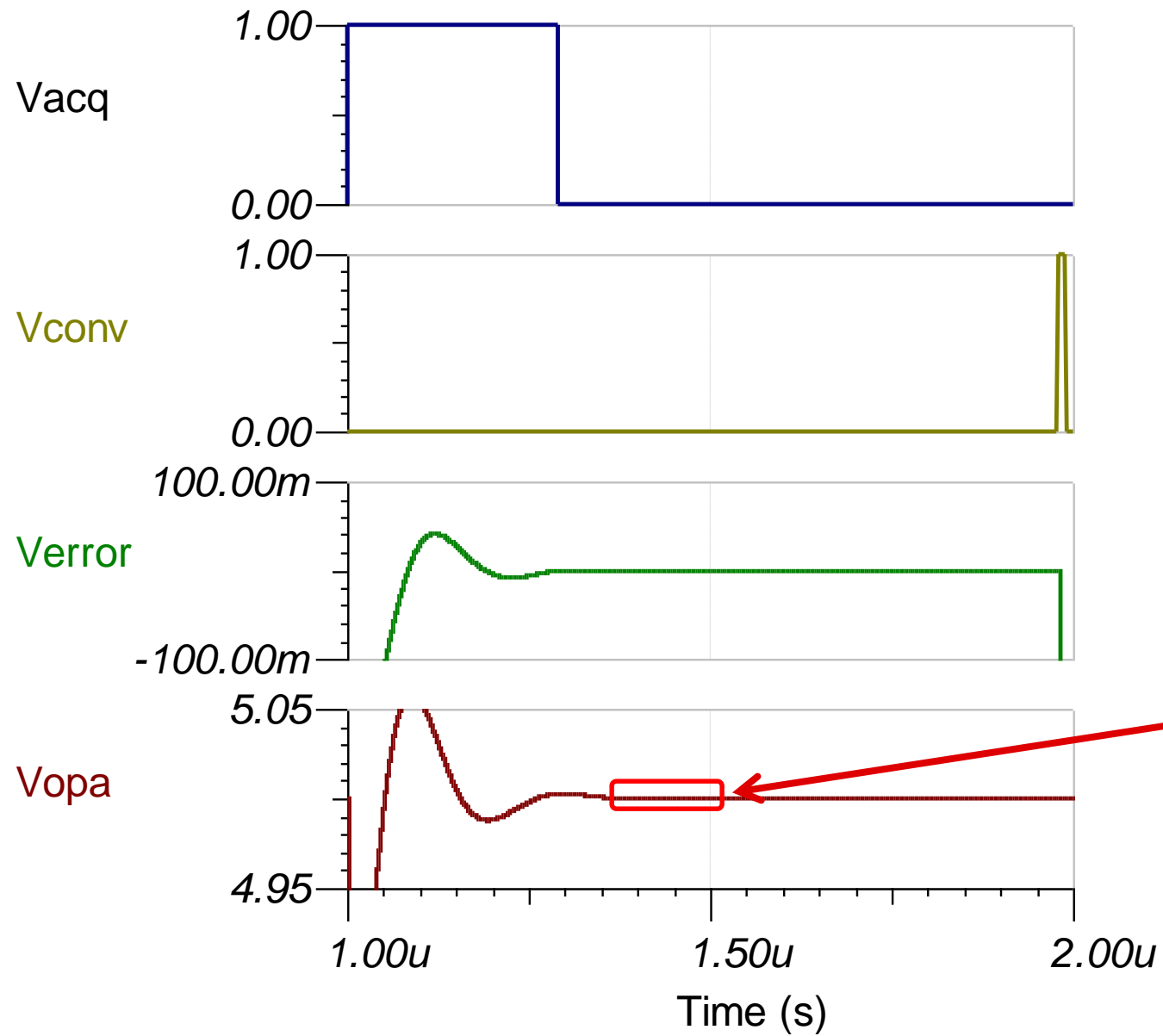
1. SAR Operation Overview
2. Select the data converter
3. Use the Calculator to find amplifier and RC filter
4. Find the Op Amp
5. Verify the Op Amp Model
6. Building the SAR Model
7. Refine the Rfilt and Cfilt values
- 8. Final simulations**
9. Measured Results
10. SAR Drive Calculator Algorithm

Expand the acquisition time to check settling



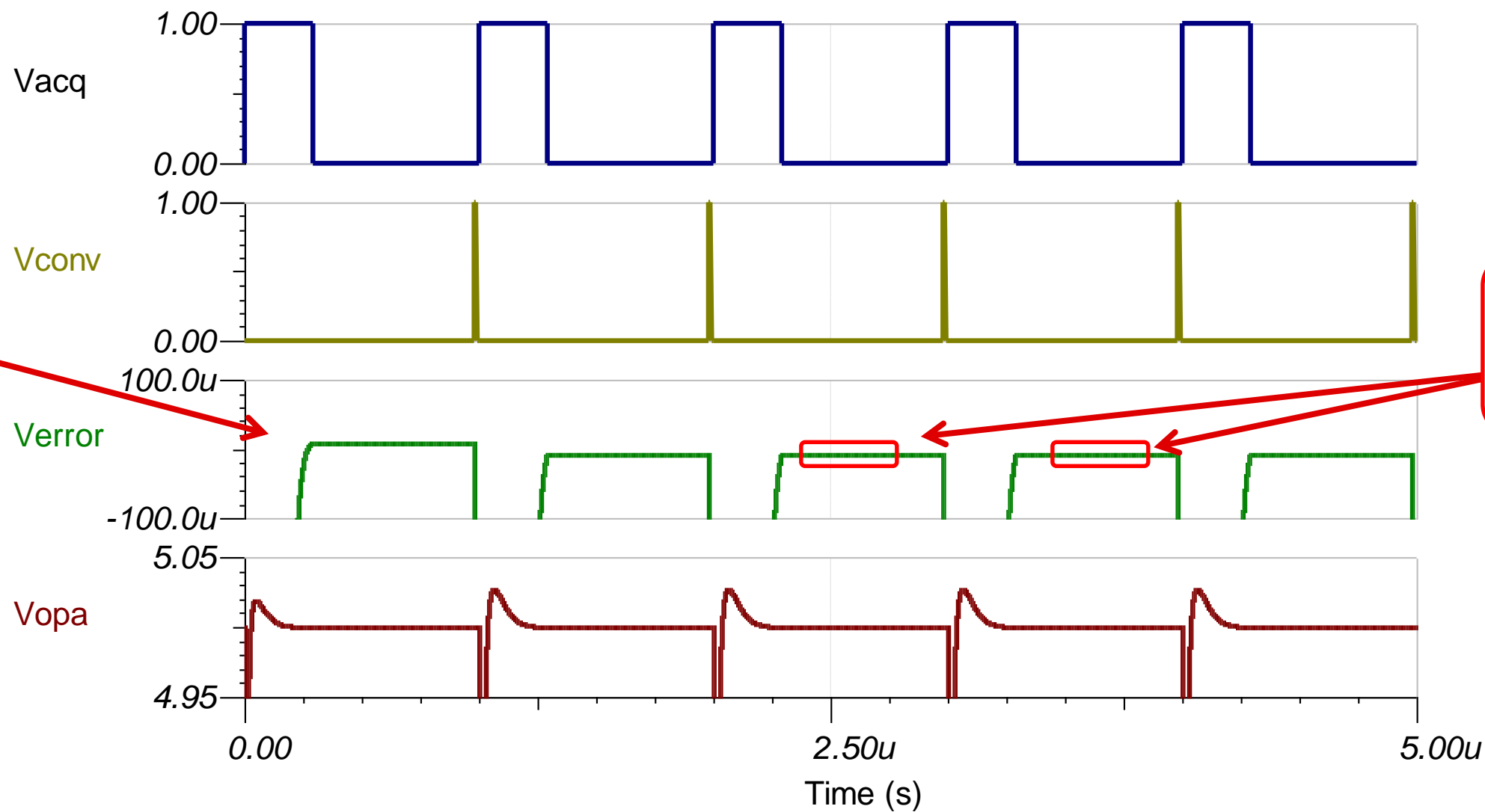
t_{acq} change in simulation only to test for marginal design. Not adjusted in real circuit.

Look at Op Amp Settling



Amplifier settled to $\frac{1}{2}$ LSB or better after tacq ends.

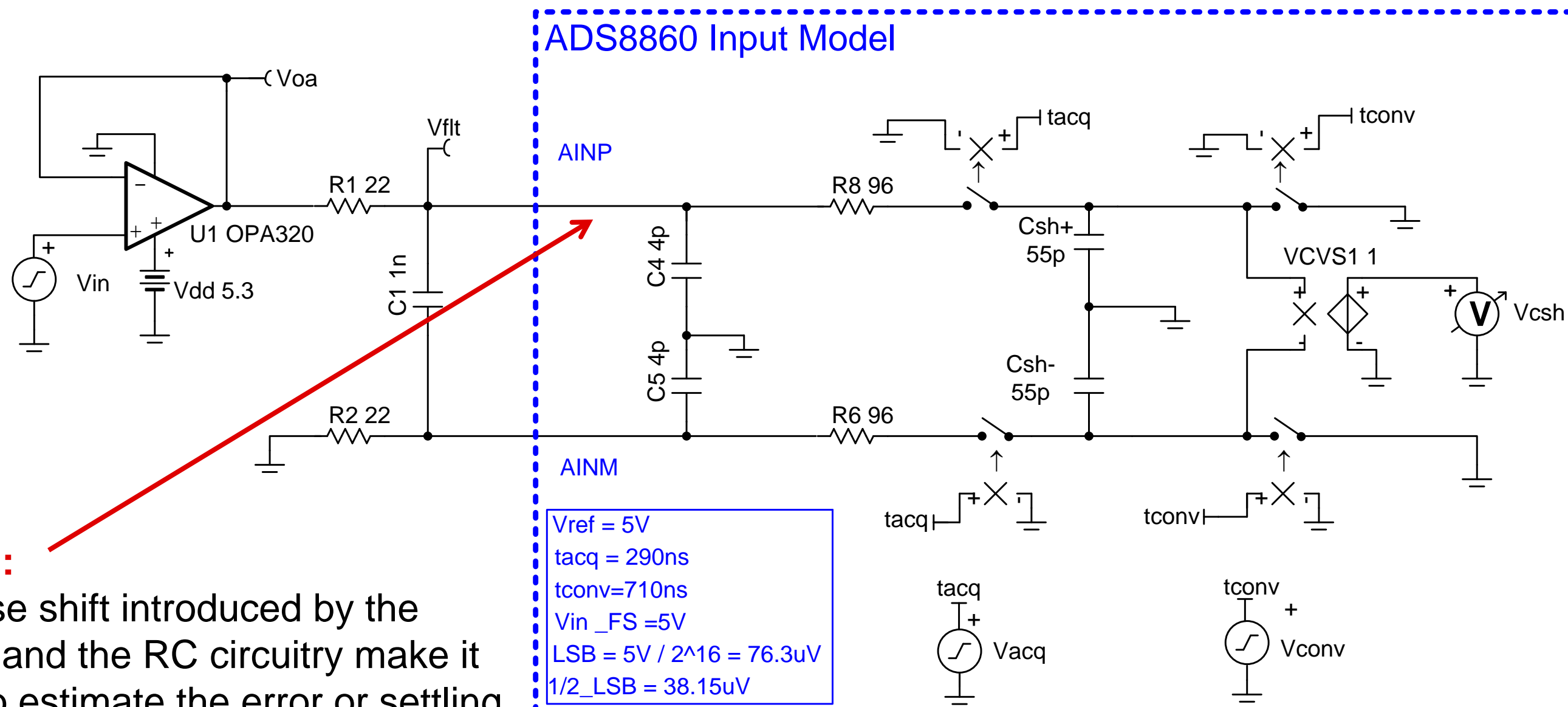
Check settling for multiple cycles



Always discard the first cycle.

Make sure that settling is consistent from cycle to cycle.

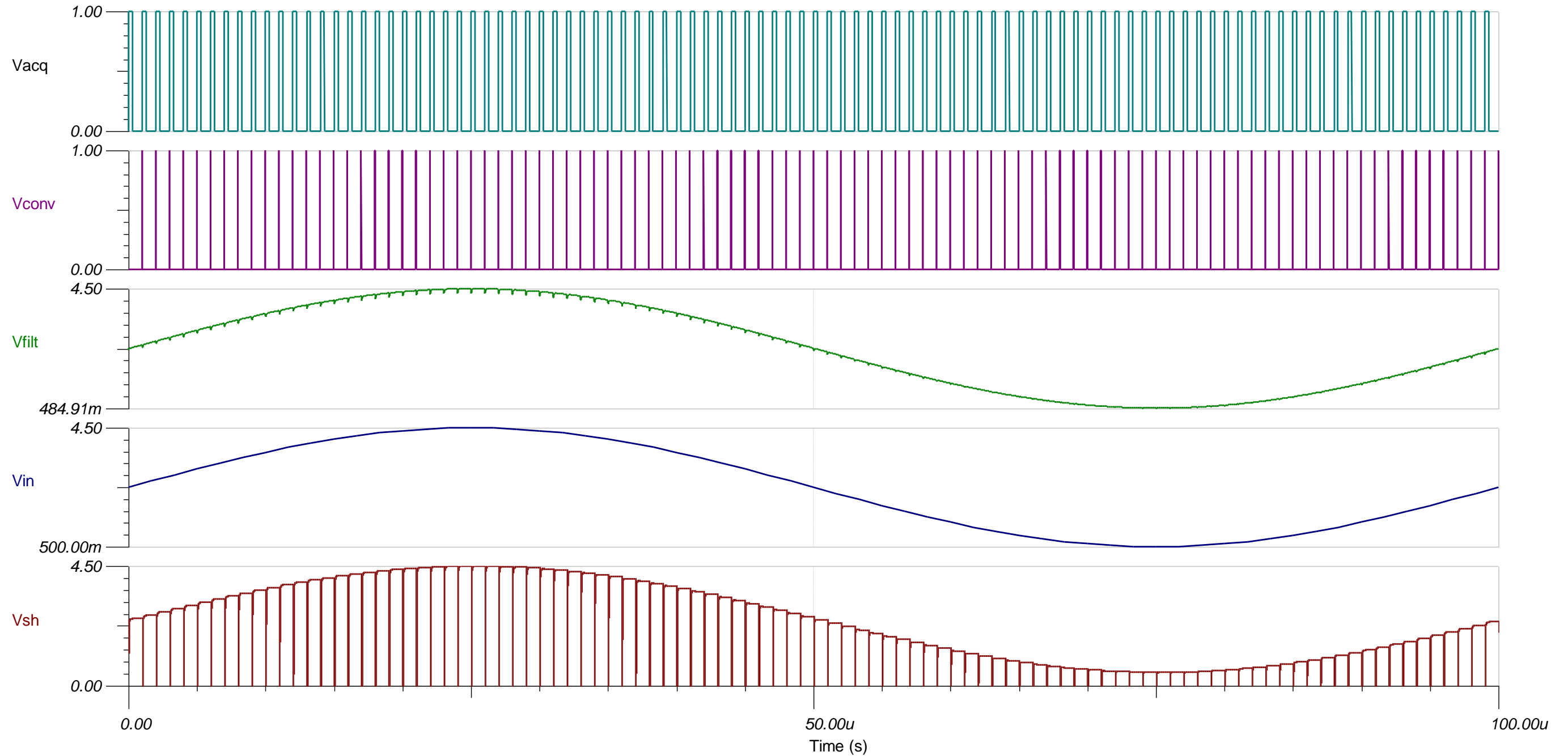
AC Input Signal Simulation Example



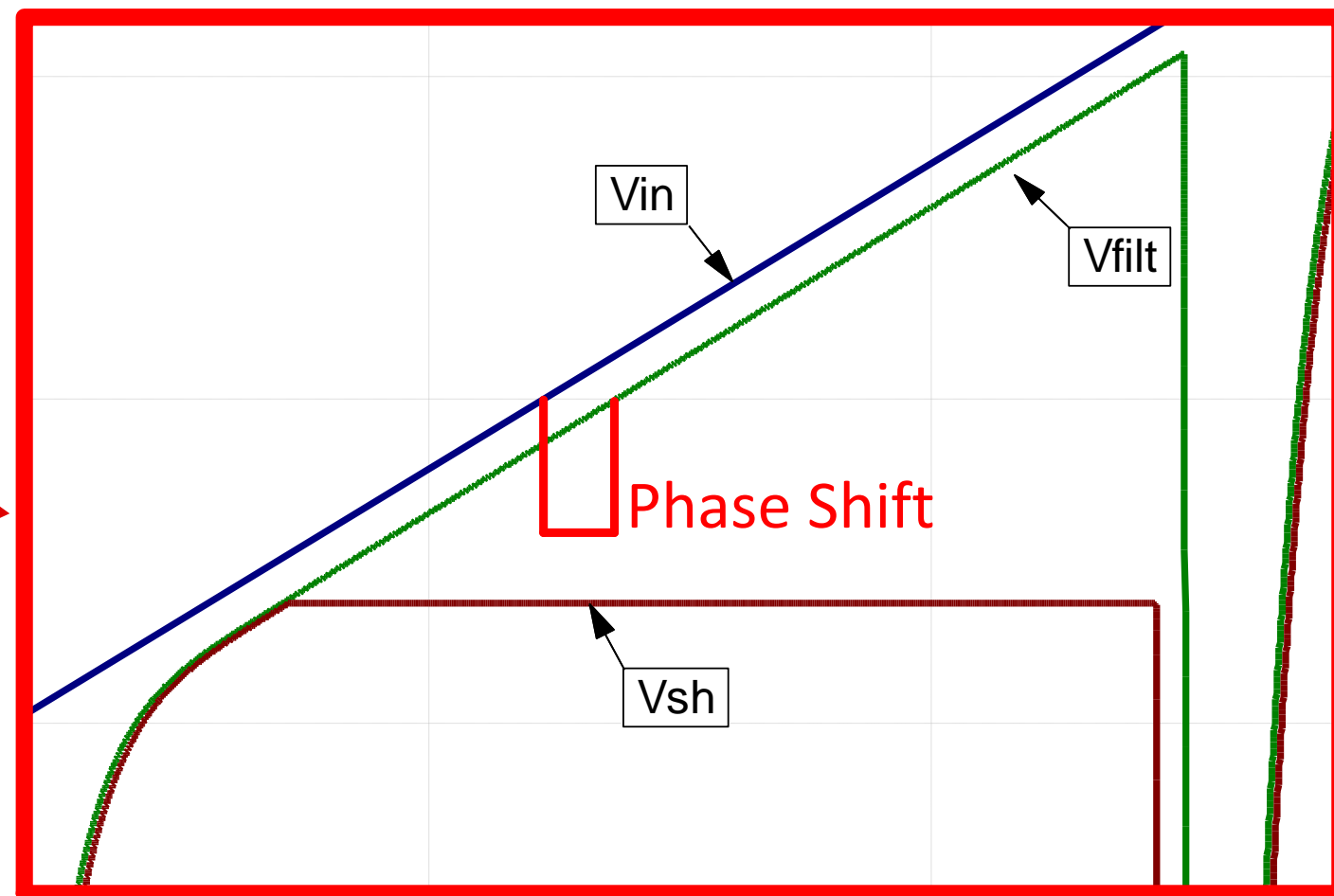
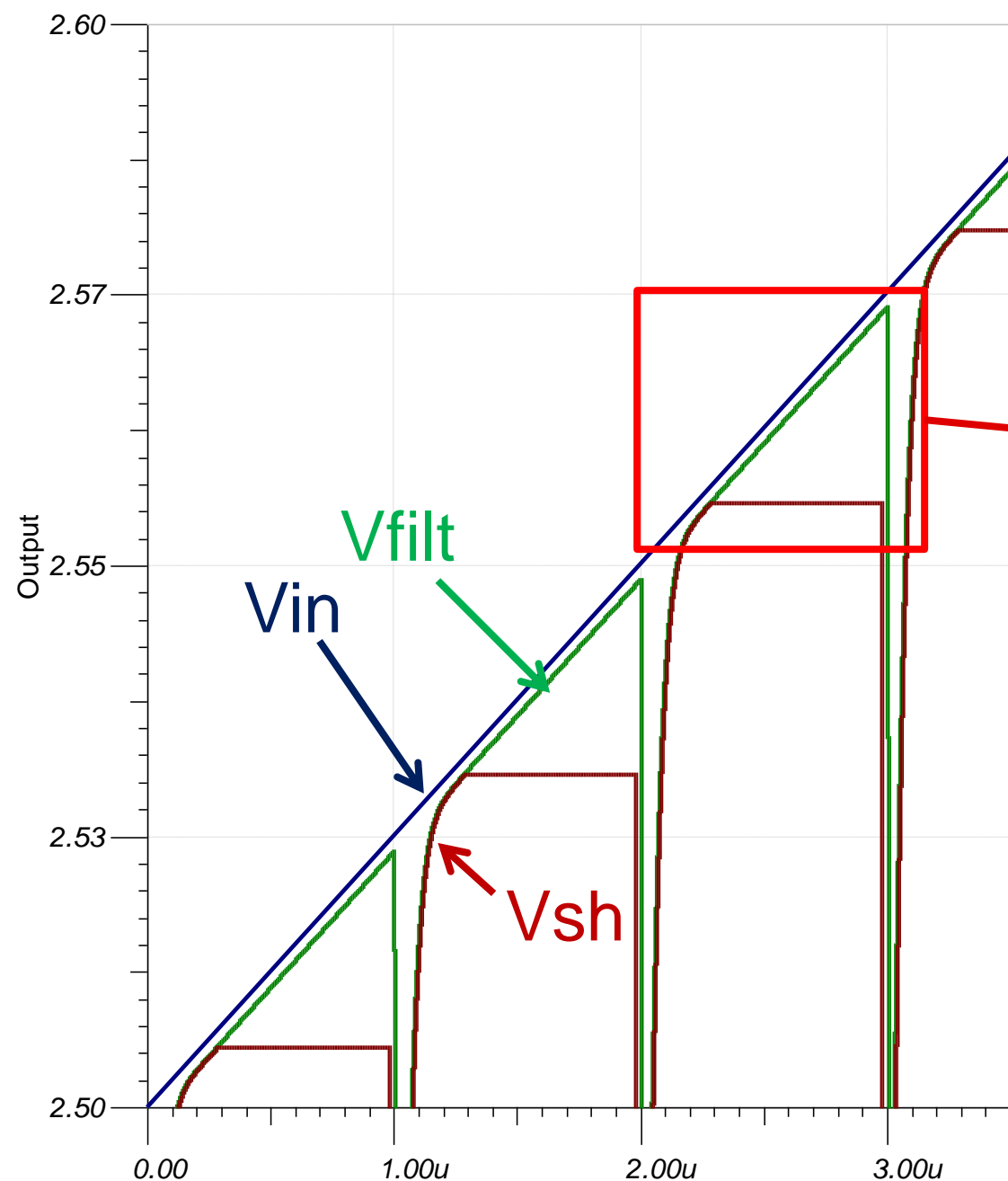
PROBLEM:

- The phase shift introduced by the amplifier and the RC circuitry make it difficult to estimate the error or settling signal

Results for an AC Simulation: What about error



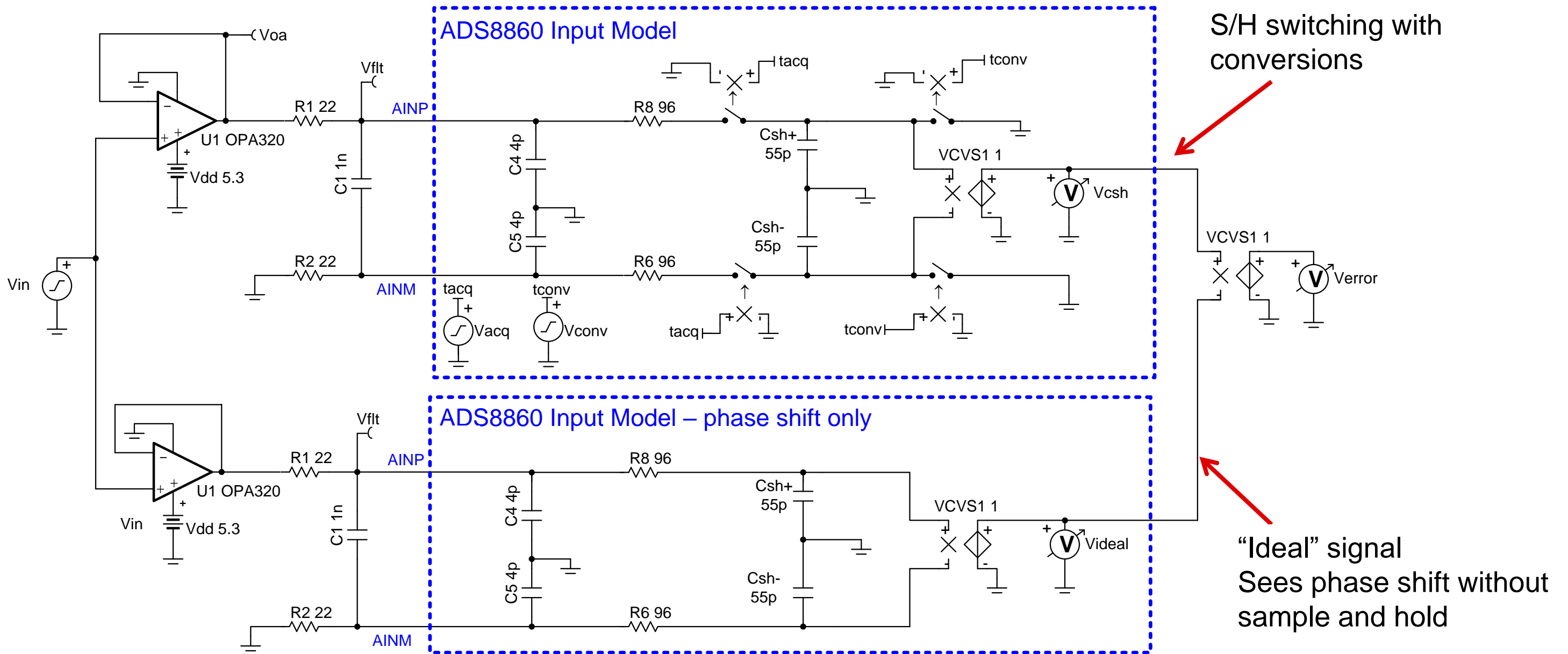
AC Input Signal Simulation Example



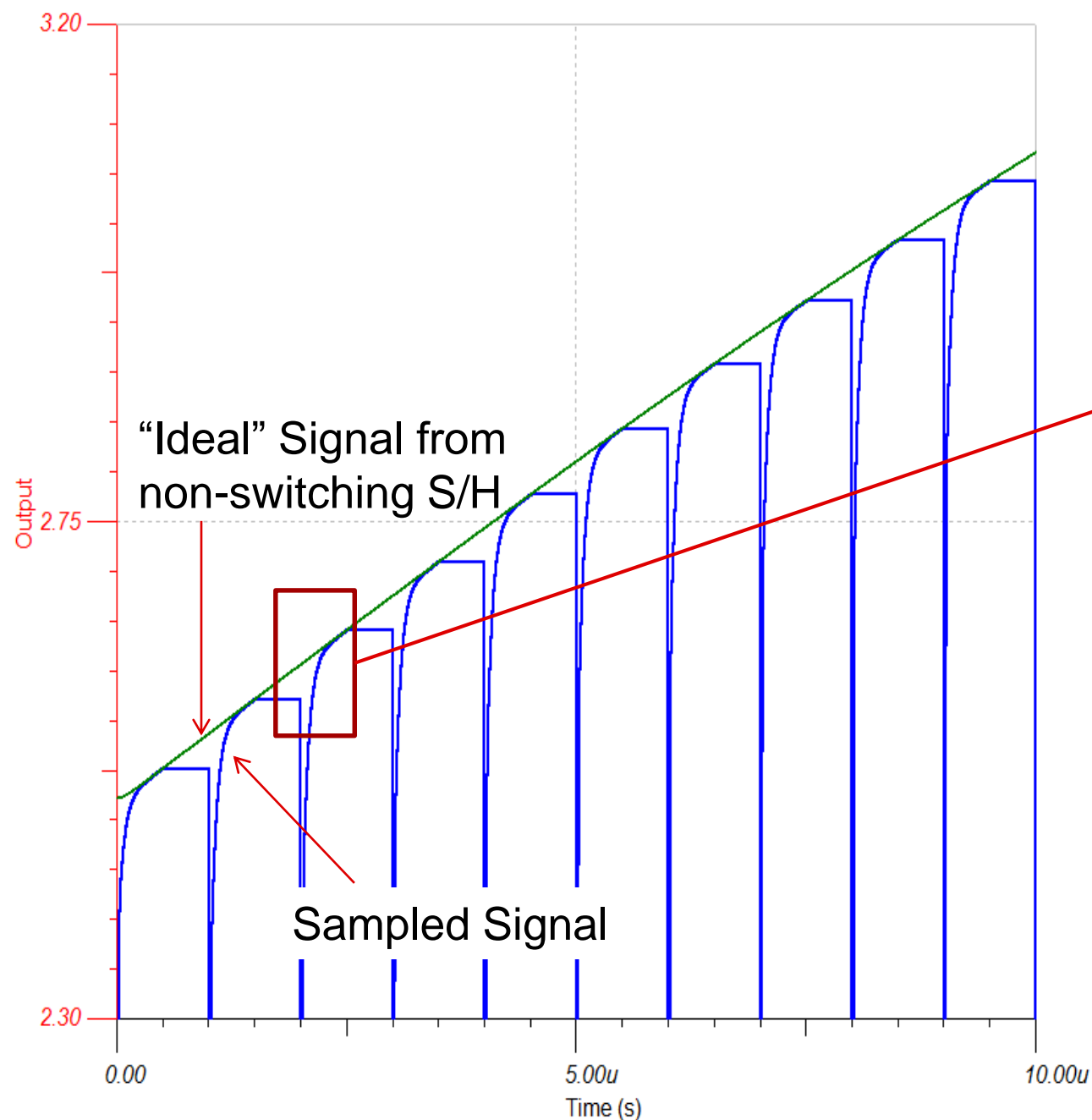
PROBLEM:

- The phase shift introduced by the amplifier and the RC circuits make it difficult to estimate the settling error in the sample and hold

AC Input Simulation Example



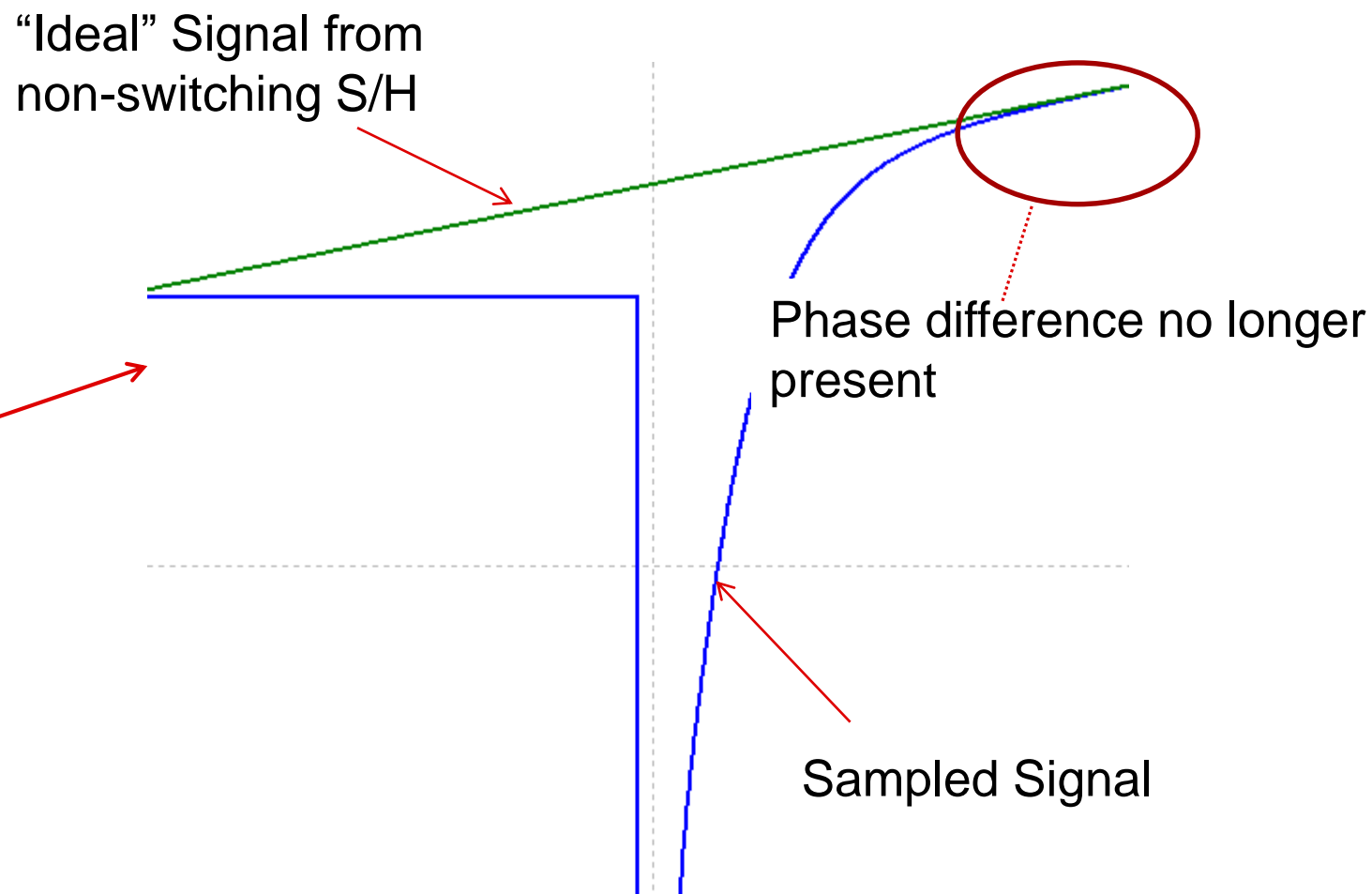
AC Input Signal Simulation Example



"Ideal" Signal from non-switching S/H

"Ideal" Signal from non-switching S/H

Sampled Signal



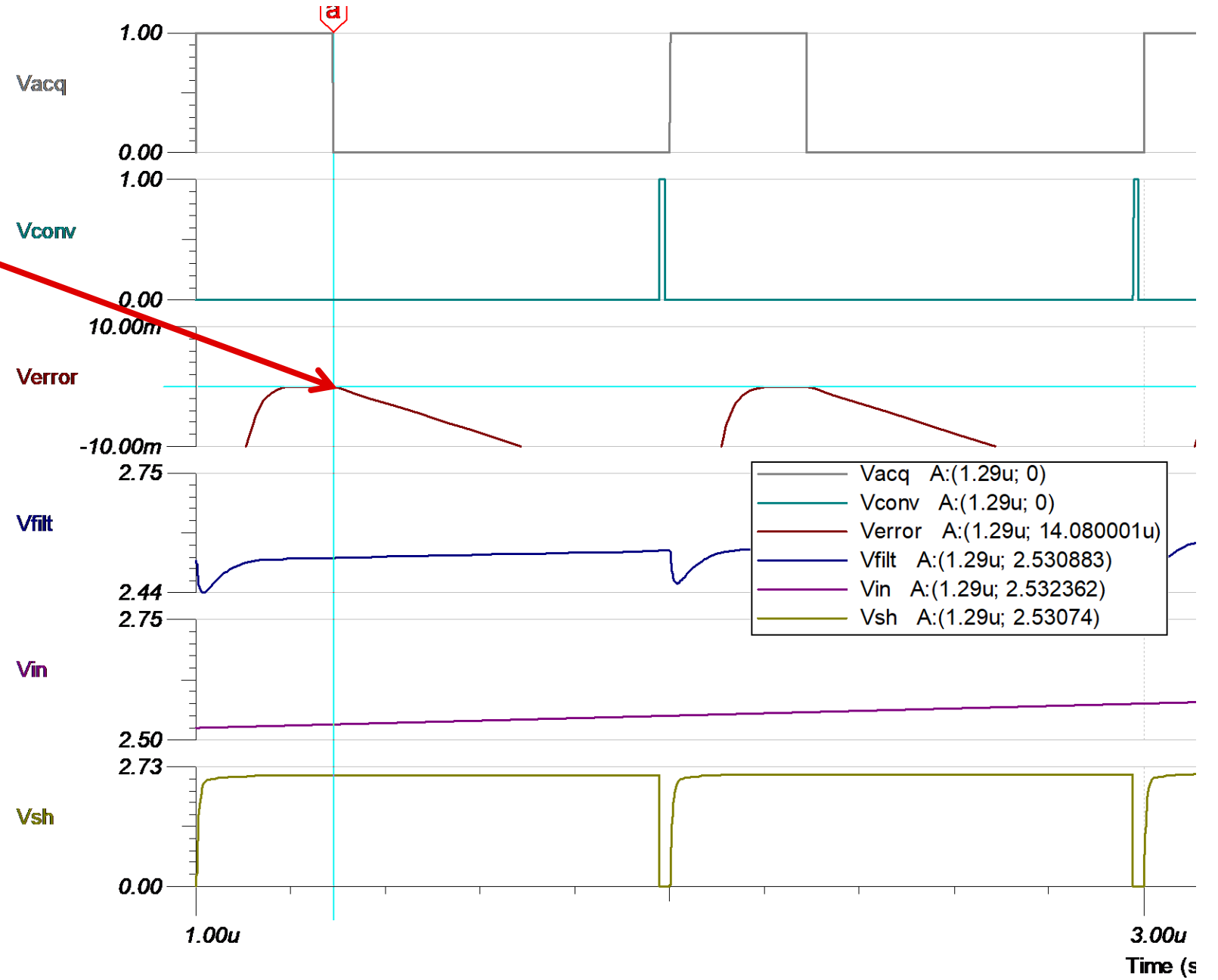
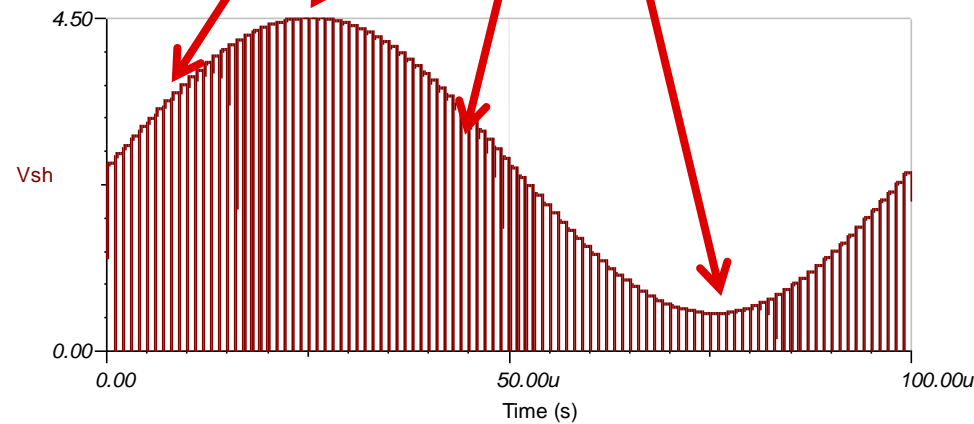
Solution:

- The "Ideal" Signal generated from non-switching S/H has same phase as the Sampled Signal; allowing the calculation of settling errors

Check the error for AC simulations

Place the cursor at the end of an acquisition cycle. Generate a legend. The error should be less than $\frac{1}{2}$ LSB.

Check the error at multiple locations



Agenda – next video...

1. SAR Operation Overview
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- 9. Measured Results**
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Thanks for your time!
Please try the quiz.

Final Simulations to Test AC Settling

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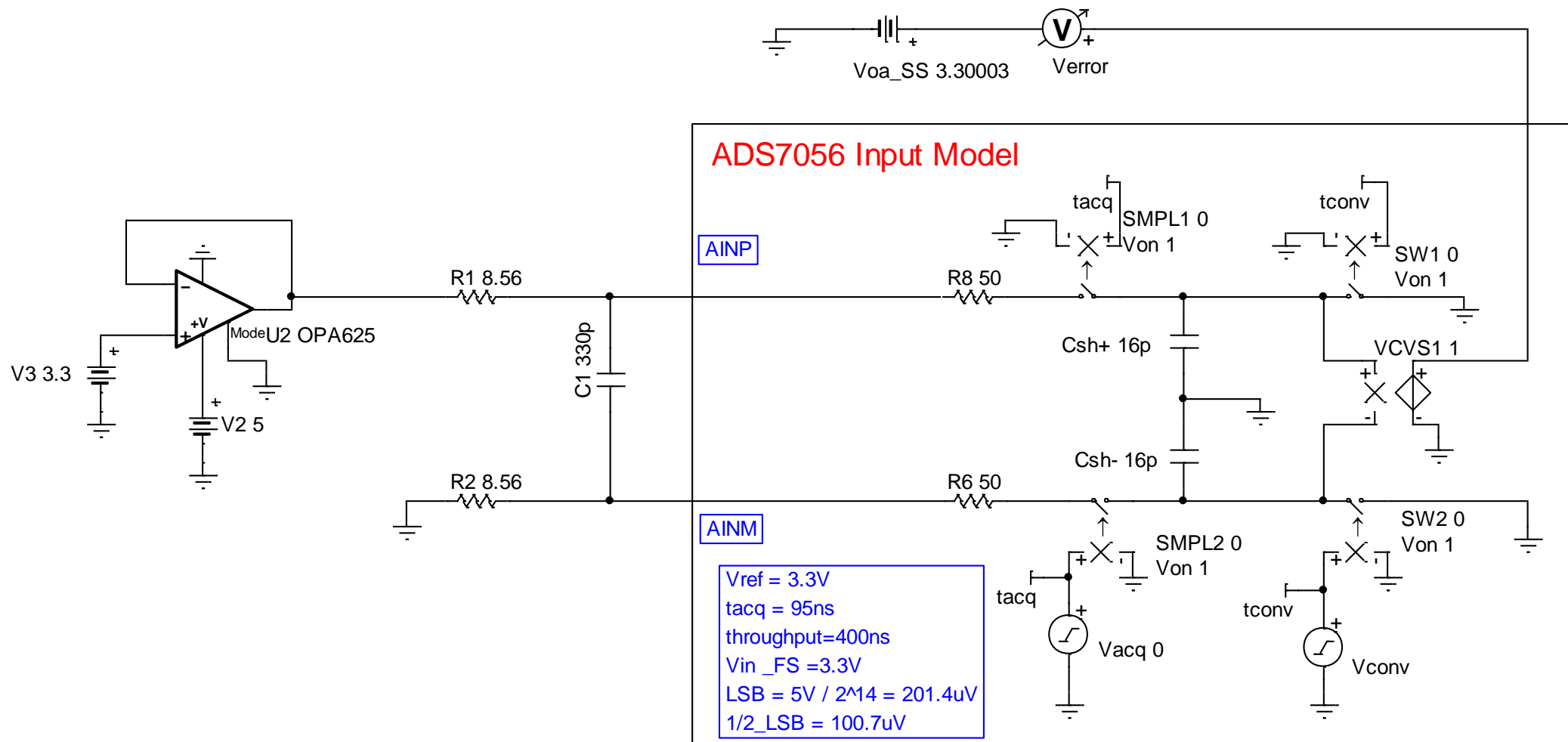
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Created by Art Kay



Final Simulations to Test AC Settling

1. Use the circuit from the previous quiz to look at settling for a 1kHz sine wave.



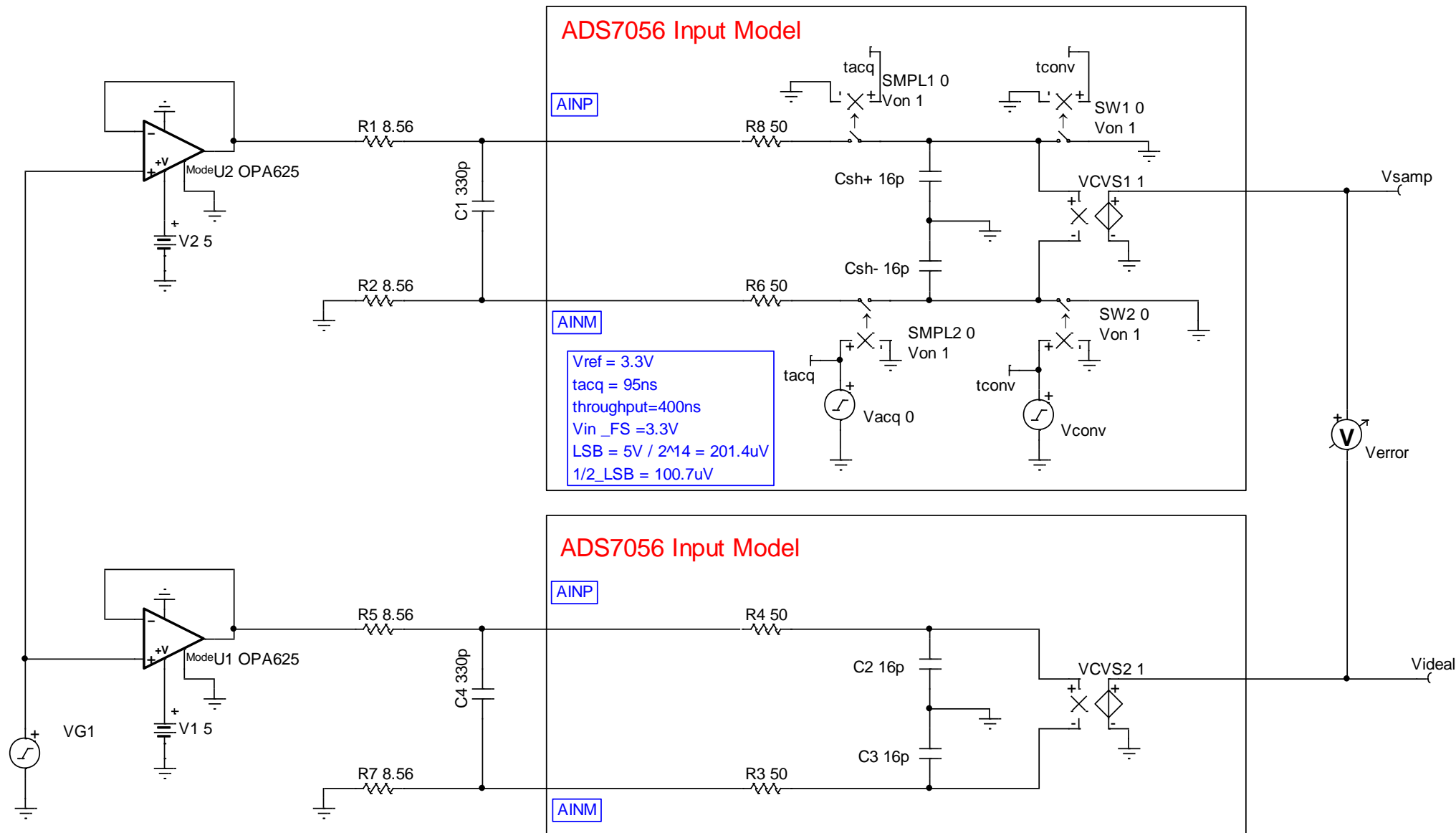

ads7056+OPA365-final standard values.TSC

Click here for
the TINA file
for starting
point

Solutions

Final Simulations to Test AC Settling

1. Use the circuit from the previous quiz to look at settling for a 1kHz sine wave.

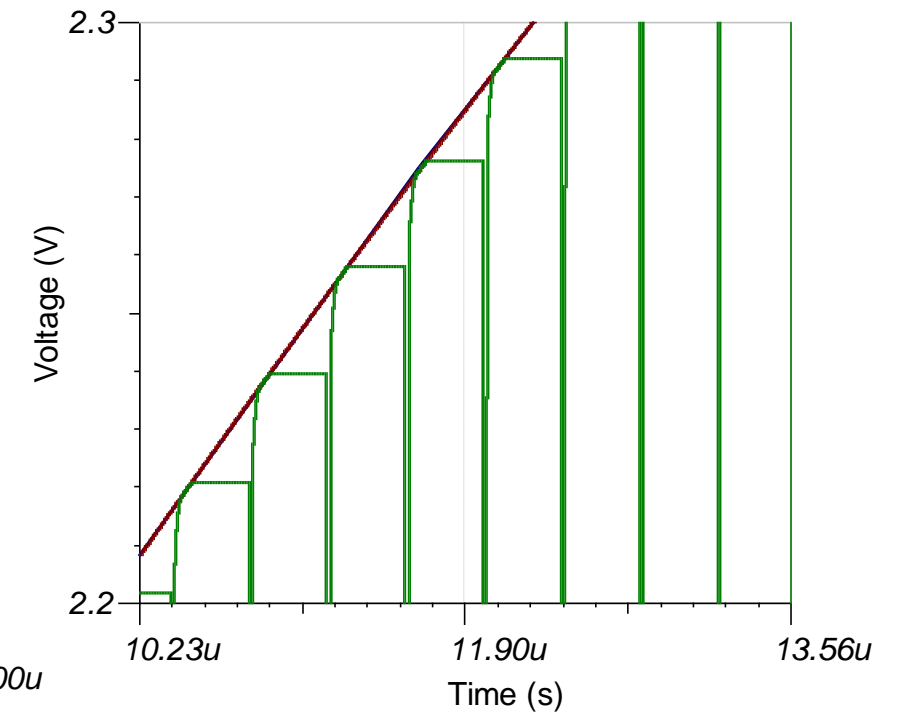
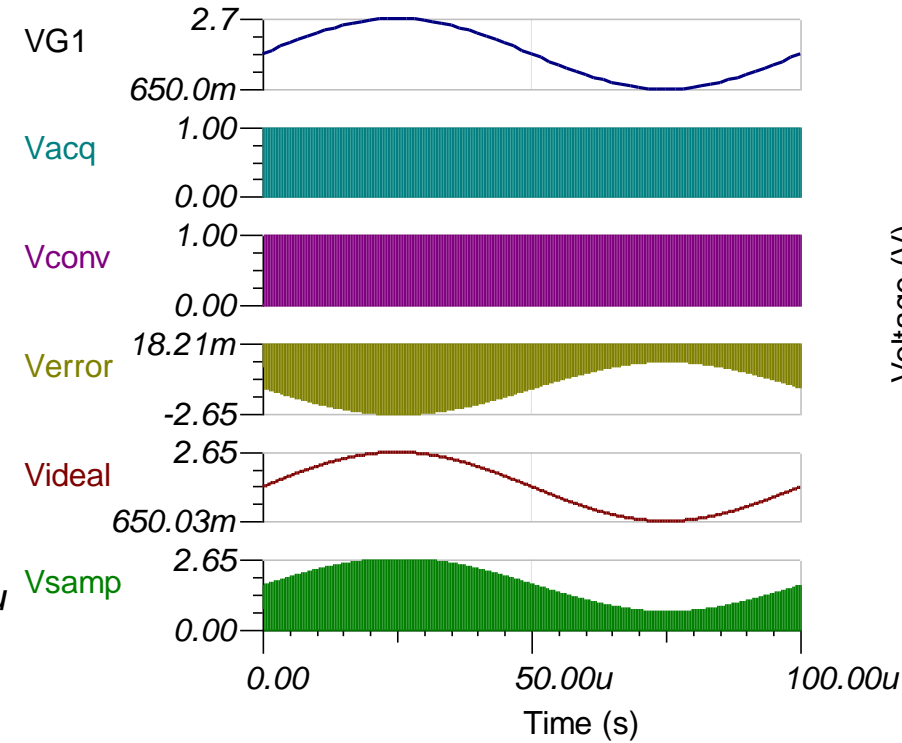
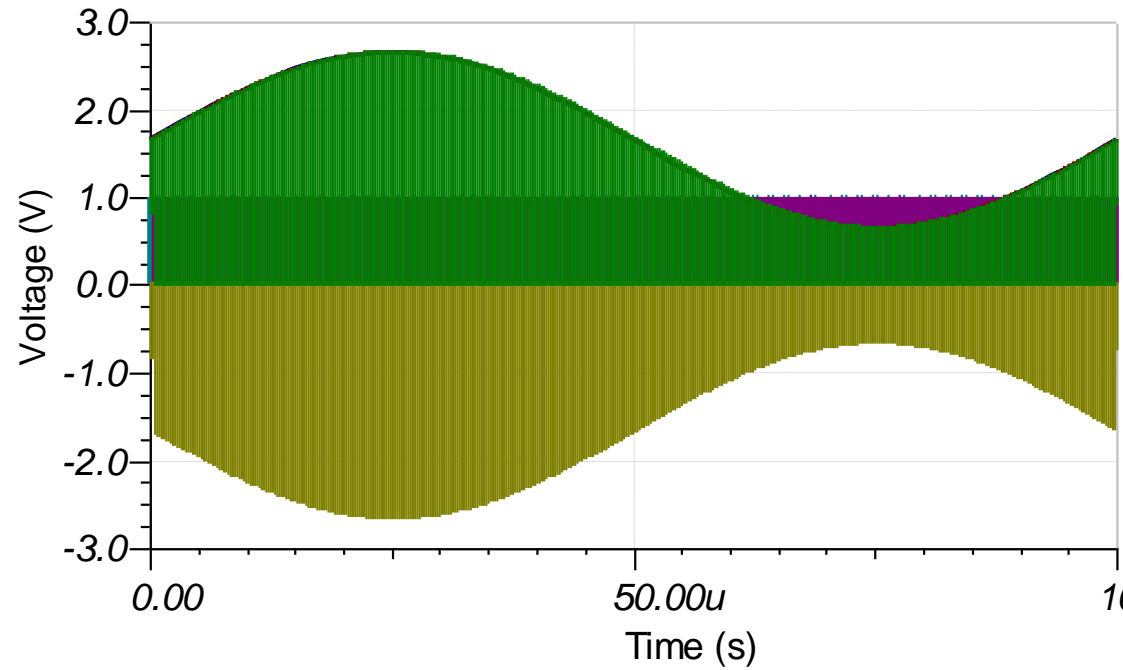


ads7056+OPA365-ac simulation.TSC

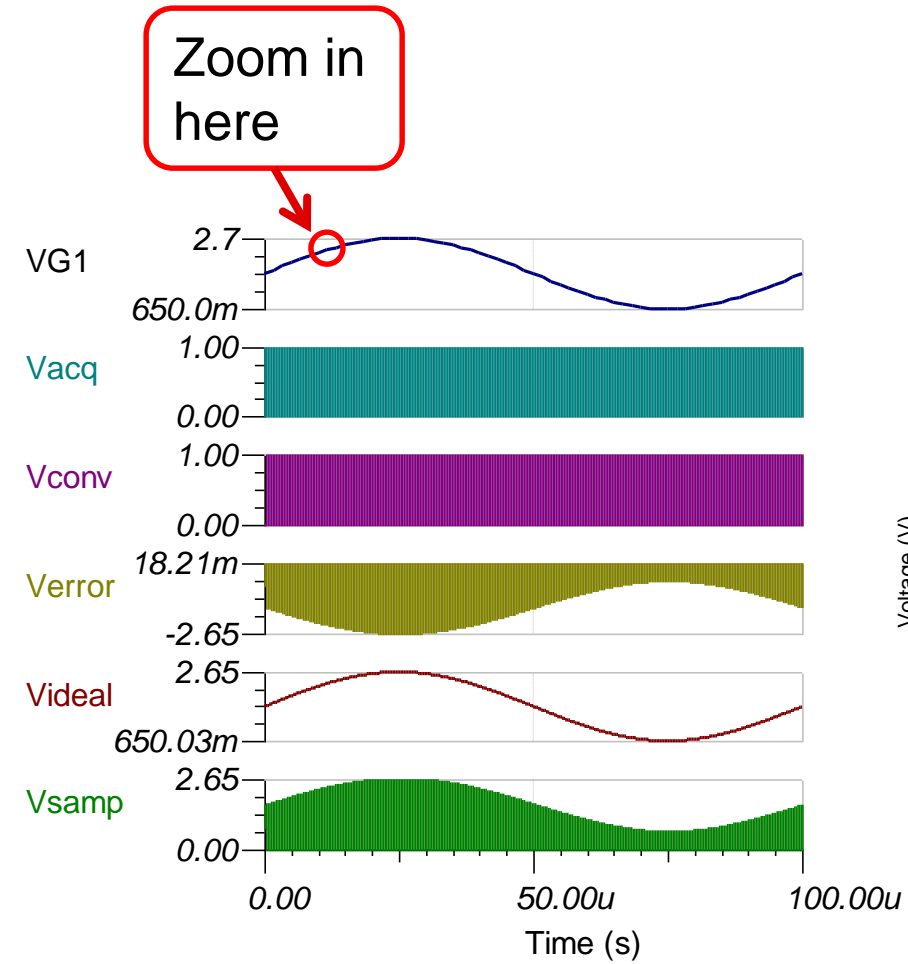
Click here for the TINA file

Final Simulations to Test AC Settling

1. Use the circuit from the previous quiz to look at settling for a 1kHz sine wave.



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Zoom in on two cycles of ADC settling

